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DIDACTIC POSSIBILITIES OF THE STEM-ORIENTED APPROACH IN TEACHING CHEMICAL DISCIPLINES IN THE TRAINING OF PHARMACISTS

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In order to ensure the modernization of education in accordance with the technological innovations of modern society and the challenges of digital transformation, the Cabinet of Ministers of Ukraine in 2020 approved the Concept for the Development of Science and Mathematics Education (STEM-education), the implementation of which is planned for the period until 2027 as a state policy to increase the level of national competitiveness economy [1].

The implementation of elements of STEM education in the training of pharmacists can provide a more thorough natural and scientific training of future pharmacists who will be able to work in the conditions of high-tech and digital pharmacy, contributing to the formation of a holistic scientific worldview of the individual and the development of high-level thinking skills. According to the educational and professional program of the specialty "Pharmacy, industrial Pharmacy", natural and scientific training is a mandatory component, which includes such disciplines as "Analytical chemistry", "Physical and colloidal chemistry", "Physico-chemical methods of analysis, when creating medicines".

The purpose of our research was to study the didactic possibilities of the STEM-oriented approach in teaching the listed chemical disciplines, which can be classified as STEM-oriented disciplines. The Analytical Chemistry discipline, which includes the sections "Instrumental Methods of Analysis" and "Metrology", provides interdisciplinary integration links with disciplines related to the natural science and professional training of pharmacists. aimed at familiarizing students with patterns and principles of information processes in systems of various levels of the pharmaceutical industry hierarchy, problems of collection, storage, processing and

transmission of signals and images in pharmacy, decision support systems in pharmacy, information technologies of analysis, mathematical computer modeling, forecasting, planning and correct conduct of statistical research in pharmacy [2].

To introduce a STEM-oriented approach, we have supplemented and modernized the content of the listed disciplines, covering topics related to STEM knowledge and skills.

On the basis of the modernized content, using elements of STEM education, teachers create appropriate opportunities to activate the work of pharmacist students, increase interest in their own education, use interdisciplinary and project approaches in order to integrate the disciplines of the chemical unit into the current modern technologies used in pharmacy. When studying a certain specific topic, educational information is presented in the form of an interdisciplinary integration of several disciplines (inorganic, analytical, physical, colloidal chemistry), the material of which is closely related to each other and has practical application in pharmacy. At each lesson, students analyze the studied material, draw conclusions, connect the educational material with life situations, demonstrate the application of the topic's provisions in real life, offer their own vision of the practical use of the acquired knowledge.

Using interdisciplinary connections, we increase the effectiveness of chemical education of pharmacy students. When studying any section of the disciplines of the chemical unit, the teacher builds integration links with other general theoretical and pharmaceutical disciplines. For example, when studying the section of analytical chemistry "Buffer systems", the concepts of alkalosis and acidosis begin to form in the course of inorganic chemistry (1st course), then they are consolidated and developed during the study of physical and colloidal chemistry (2nd course), biochemistry, normal and pathological physiology (3rd course) and further when studying pharmaceutical disciplines (pharmaceutical chemistry, pharmacology, etc. - 4-5 courses), and then in professional activities. The inclusion of chapters such as "Redox processes and balances" in the content of chemical disciplines will contribute to understanding the emergence of bioelectric potentials and heart rhythm disorders. Equally important and professionally oriented in the structure of chemical disciplines is the section "Teaching about solutions", when mastering which students can: perform calculations necessary for the preparation of perfusion solutions, calculate the value of the hydrogen index, predict processes such as plasmolysis, hemolysis, acidosis, alkalosis, to understand the processes occurring during the operation of the "Artificial Kidney" apparatus, as well as to simulate biochemical processes.

Educational and methodological manual [3] and two methodological manuals for preparation for "Step-1. Pharmacy" [4,5] for domestic students and translated into French and English for foreign and domestic students [6,7], created by the teachers of the department, aimed not only at the generalization and accessibility of the material of the programs of the courses of chemical disciplines, but also at the identification of all types interdisciplinary connections.

Thus, students acquire the skills of critical thinking, formulating and expressing opinions, defending their point of view on the problem being solved, practical

presentation of the results of their work. Work in the main directions of STEM-education forms in students important qualities of future competent specialists, namely: being able to recognize a problem, identify possible sides and connections in a problem, formulate the direction of scientific work and indicate ways to solve it., defend your point of view; flexibility in accepting and understanding a new point of view on a given problem; originality of solving the problem; the ability to analyze, abstract, specify, synthesize.

Printed textbooks meet the requirements of STEM education and act as an effective means of integrated training of students - pharmacists, which will contribute to the formation of natural, scientific and research competence of students and their creative abilities. The traditional formulation of the general goals of textbooks is that during a certain period of study the student will gain new knowledge, answer the question: what knowledge, abilities, and skills will the student acquire by using its content. The final result of the quality of textbooks in the disciplines of the chemical unit will be evidence of the level of acquired knowledge, formed abilities, skills, as well as the development of personal qualities, which are recognized as leading both in the past and in the conditions of updated standardized education. Given this, the difference lies in the choice of ways, methods, and conditions for improving education through the introduction of STEM - education. The content of the textbooks contains a sufficient volume of variable material for various forms of work (independent, group and individual), which indicates its multifunctional role and is intended to help students not only in learning knowledge, possessing information, but also to improve their research skills, to form innovative thinking, which is the main goal of STEM education.

Thus, the educational process approaches the real, diverse directions of scientific and professional activity of future pharmacists.

We see the didactic possibilities of the STEM-oriented approach in the teaching of the disciplines of the chemical unit in the development in students of a holistic scientific outlook, innovative thinking, research, analytical, creative skills, the formation of STEM competence, the implementation of innovative, research and experimental activities through the integration of knowledge from the natural sciences, technologies, engineering and mathematics with a synergistic combination of traditional and innovative teaching methods, implementation of STEM-oriented interdisciplinary projects in order to ensure the readiness of future pharmacists to work in the conditions of high-tech digital health care and further use of STEM knowledge and skills in professional activities. The introduction of a STEM-oriented approach as a modern and relevant paradigm of education in a high-tech society, in particular, when teaching the listed chemical disciplines, has proven its effectiveness, significant didactic opportunities and the creation of conditions for the formation of the latest STEM competencies in students and future specialists.

References

1. Розпорядження Кабінету міністрів України від 5 серпня 2020 р. № 960-р «Про схвалення Концепції розвитку природничо-математичної освіти

(STEM-освіти)». URL: <https://zakon.rada.gov.ua/laws/show/960-2020-%D1%80#Text> (дата звернення: 07.04.2021).

2. Чалий О. В., Кривенко І.П., Чалий К.О. Організація інтерактивного дистанційного навчання з інформатичних дисциплін для майбутніх фахівців галузі охорони здоров'я в умовах карантину. Розділ у монографії «Екстрене дистанційне навчання в Україні» за ред. В. М. Кухаренка, В. В. Бондаренка. Харків: Вид-во КП «Міська друкарня». 2020. С. 318–327 URL: <http://dl.khpi.edu.ua/mod/resource/view.php?id=46362> (дата звернення 4.04.2021).

3. Подплетня О.А., Хмельникова Л.І. Навчальний посібник Аналітична, фізколоїдна хімія та метрологія.- Дніпро:Дніпро-VAL., 2020. -238 с.

4. Маслак Г.С., Хмельникова Л.І. Методичний посібник для студентів для підготовки до «Крок 1. Фармація» з дисципліни «Аналітична хімія».- Дніпро:Дніпро-VAL., 2020.-197 с.

5. Маслак Г.С., Хмельникова Л.І. Методичний посібник для студентів для підготовки до «Крок 1. Фармація» з дисципліни «Фізична і колоїдна хімія».- Дніпро:Дніпро-VAL., 2020.-207 с.

6. Manuel méthodique de chimie analytique pour la préparation à «KROK - 1. Pharmacie» / Ganna Maslak, Lyudmila Khmelnikova / G. Maslak, L. Khmelnikova. Dnipro-VAL, 2021. 201 p.

7. Manuel méthodique de chimie physique et colloïdale pour la préparation à «KROK - 1. Pharmacie» / Lyudmila Khmelnikova, Ganna Maslak/L. Khmelnikova, G.Maslak. Dnipro-VAL, 2021. 217 p.